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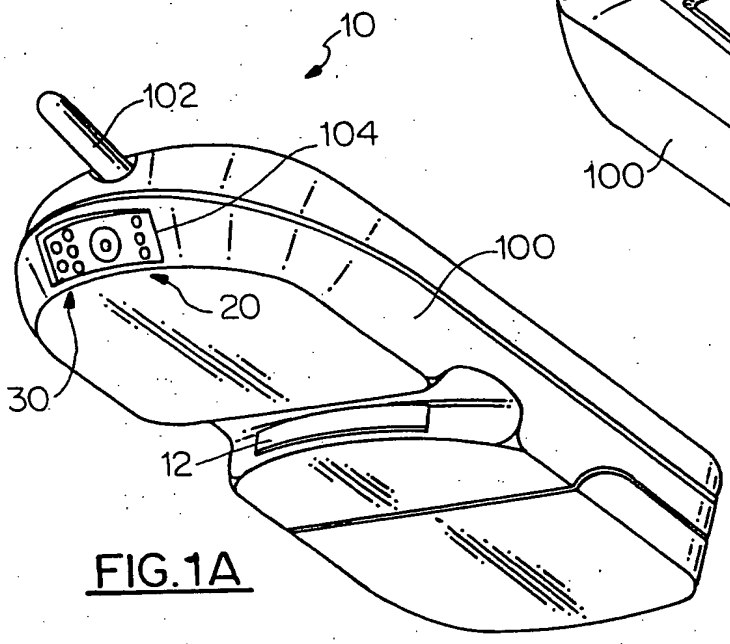

FIG.1A

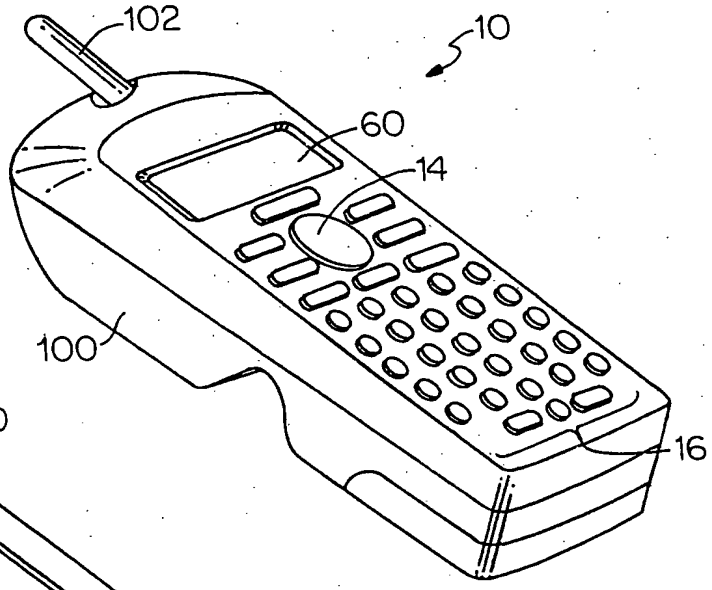

FIG.1B

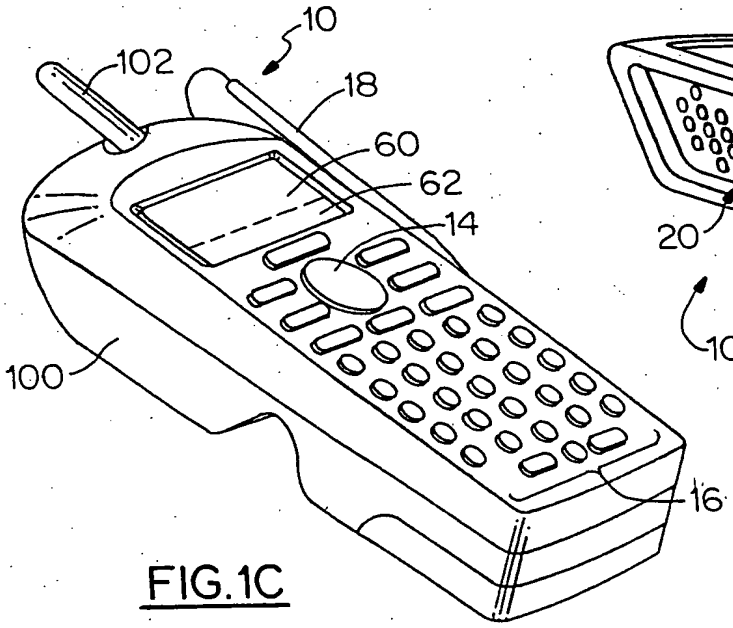

FIG.1C

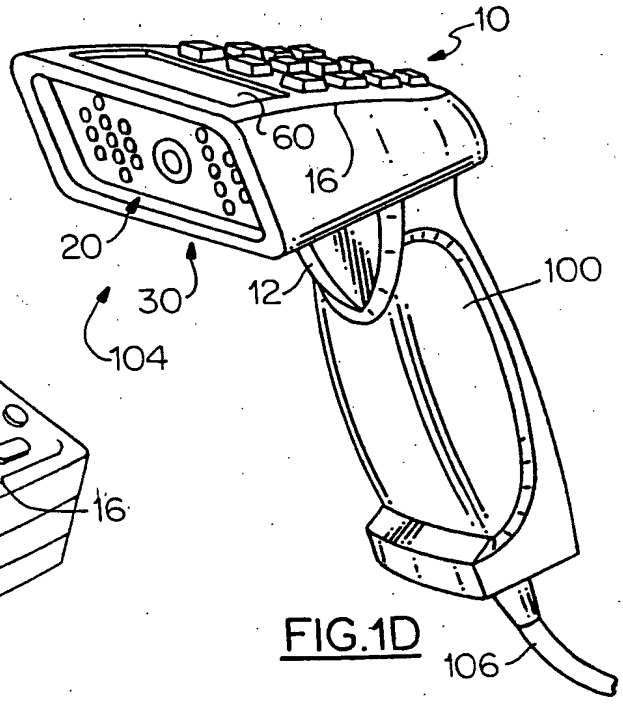

FIG.1D

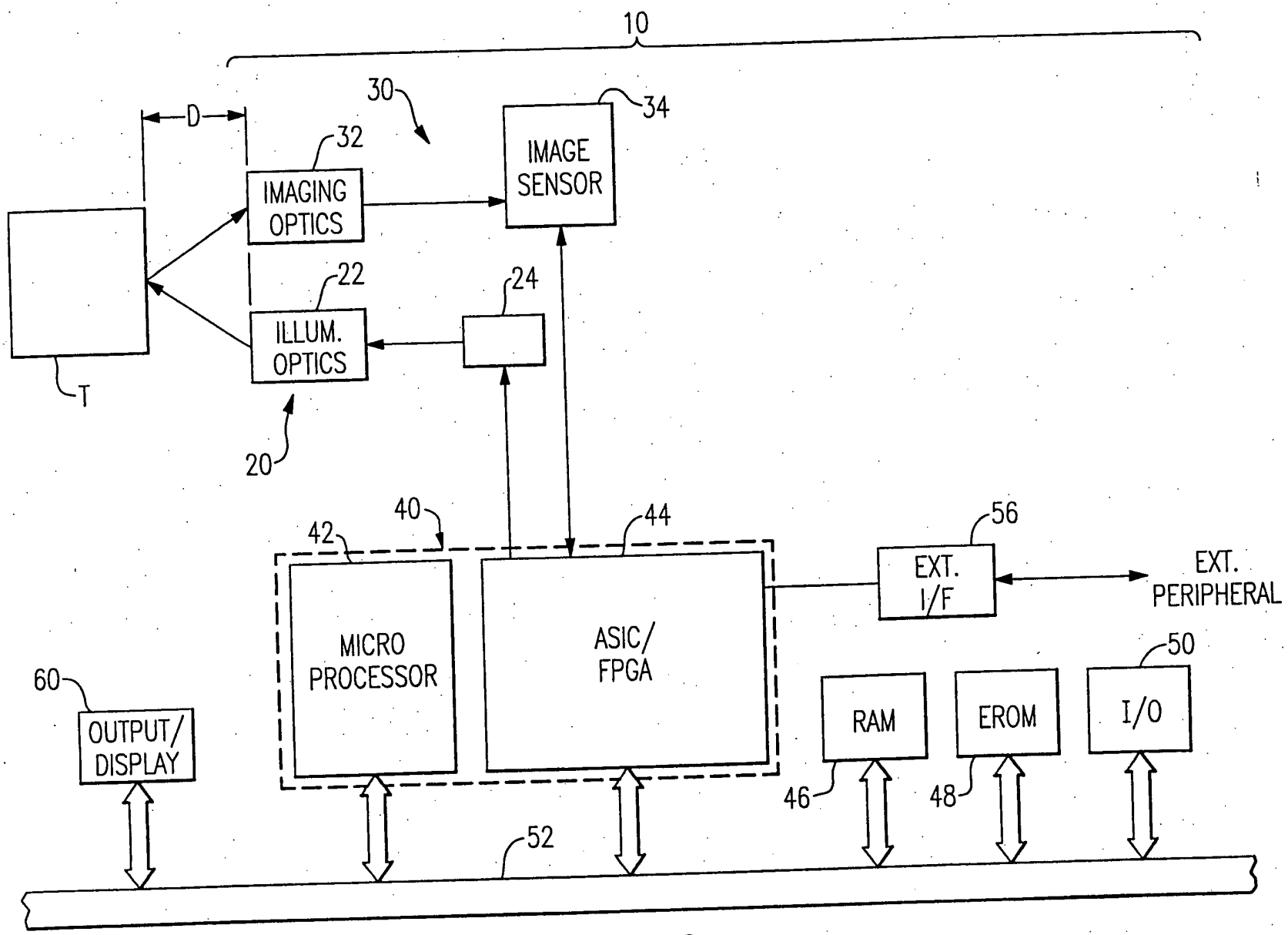
10
30
D
32
IMAGING OPTICS
34
IMAGE SENSOR
22
ILLUM. OPTICS
24
T
20
40
42
44
MICRO PROCESSOR
ASIC/ FPGA
56
EXT. I/F
EXT. PERIPHERAL
60
OUTPUT/ DISPLAY
50
RAM
EROM
I/O
46
48
52

FIG.2

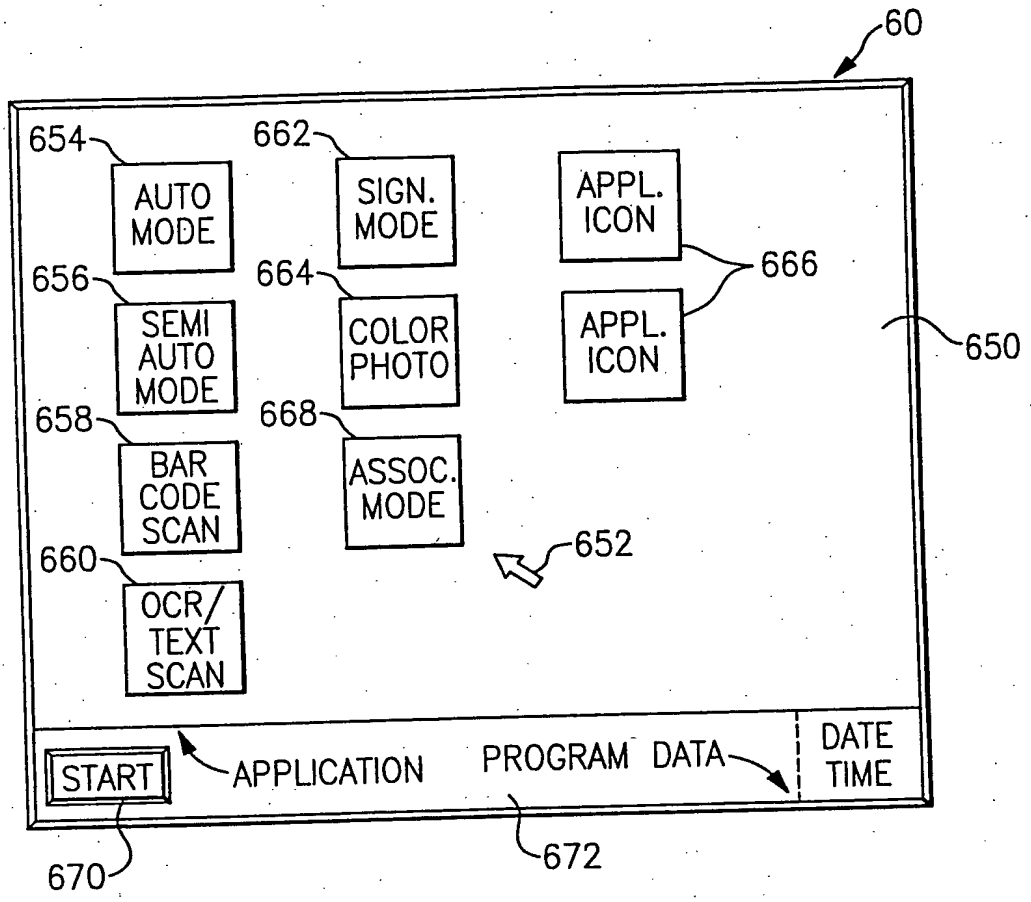
60
654
AUTO MODE
662
SIGN. MODE
APPL. ICON
666
656
SEMI AUTO MODE
664
COLOR PHOTO
APPL. ICON
650
658
BAR CODE SCAN
668
ASSOC. MODE
652
660
OCR/ TEXT SCAN
START
APPLICATION
PROGRAM DATA
DATE TIME
670
672

FIG.3

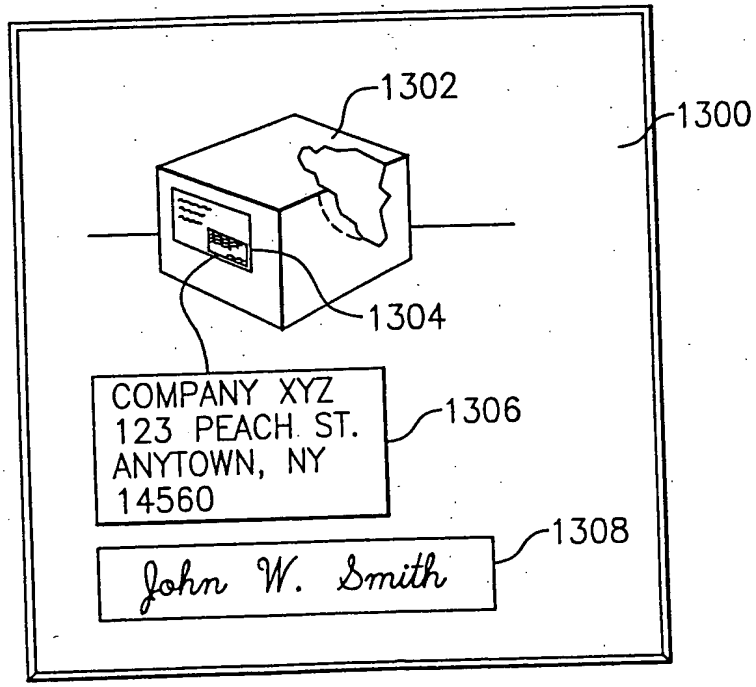
1302
1300
1304
COMPANY XYZ
123 PEACH ST.
ANYTOWN, NY
14560
1306
John W. Smith
1308

FIG.13

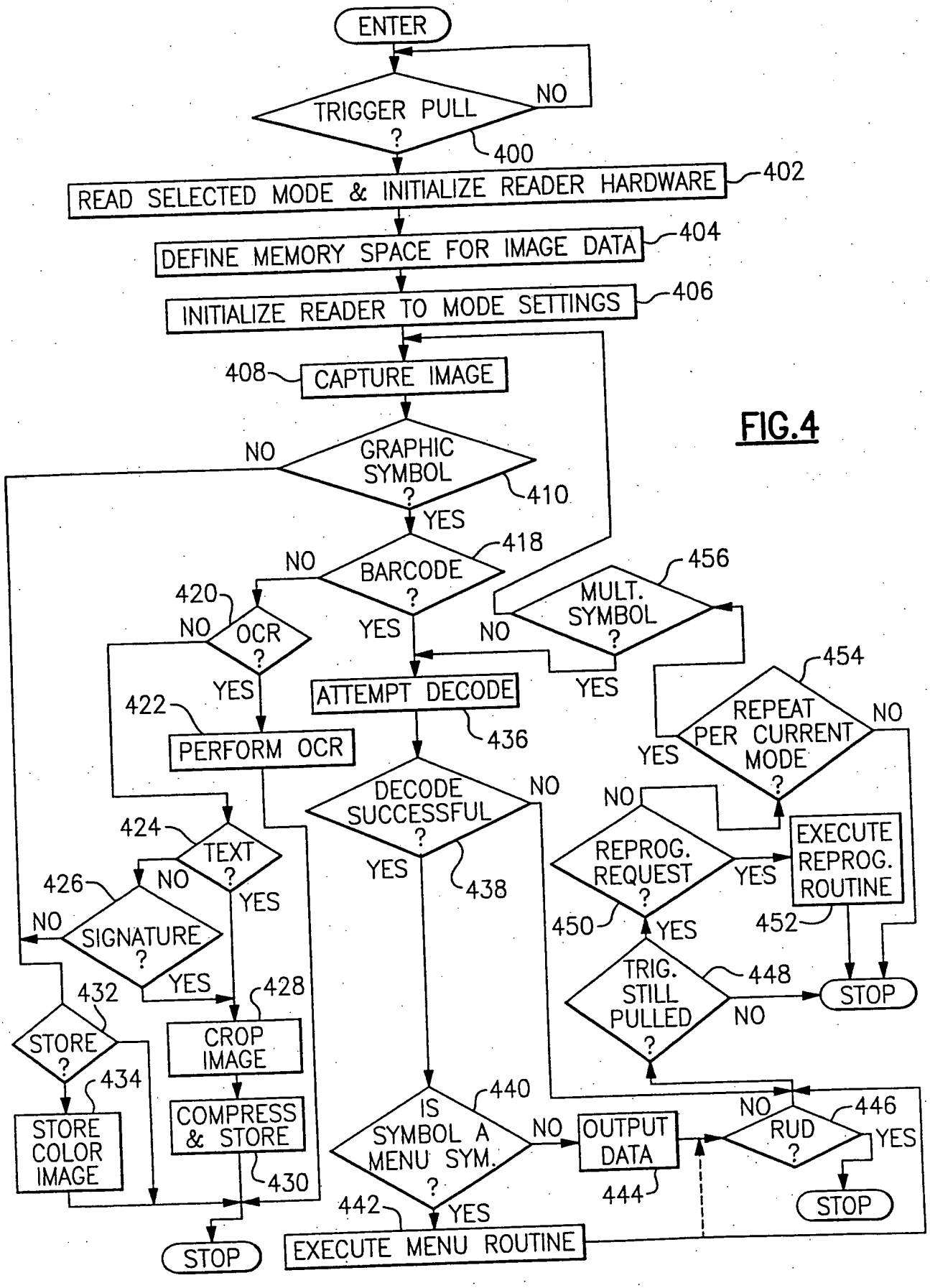
ENTER
TRIGGER PULL ?
NO
400
READ SELECTED MODE & INITIALIZE READER HARDWARE
402
DEFINE MEMORY SPACE FOR IMAGE DATA
404
INITIALIZE READER TO MODE SETTINGS
406
408
CAPTURE IMAGE
GRAPHIC SYMBOL ?
NO
410
YES
BARCODE ?
418
NO
YES
420
OCR ?
NO
YES
422
PERFORM OCR
ATTEMPT DECODE
436
MULT. SYMBOL ?
456
NO
YES
DECODE SUCCESSFUL ?
NO
YES
438
454
REPEAT PER CURRENT MODE ?
NO
YES
424
TEXT ?
NO
YES
426
SIGNATURE ?
NO
YES
428
CROP IMAGE
COMPRESS & STORE
430
432
STORE ?
434
STORE COLOR IMAGE
STOP
IS SYMBOL A MENU SYM. ?
440
NO
YES
442
EXECUTE MENU ROUTINE
OUTPUT DATA
444
REPROG. REQUEST ?
NO
YES
450
EXECUTE REPROG. ROUTINE
452
TRIG. STILL PULLED ?
448
NO
STOP
RUD ?
446
NO
YES
STOP

FIG.4

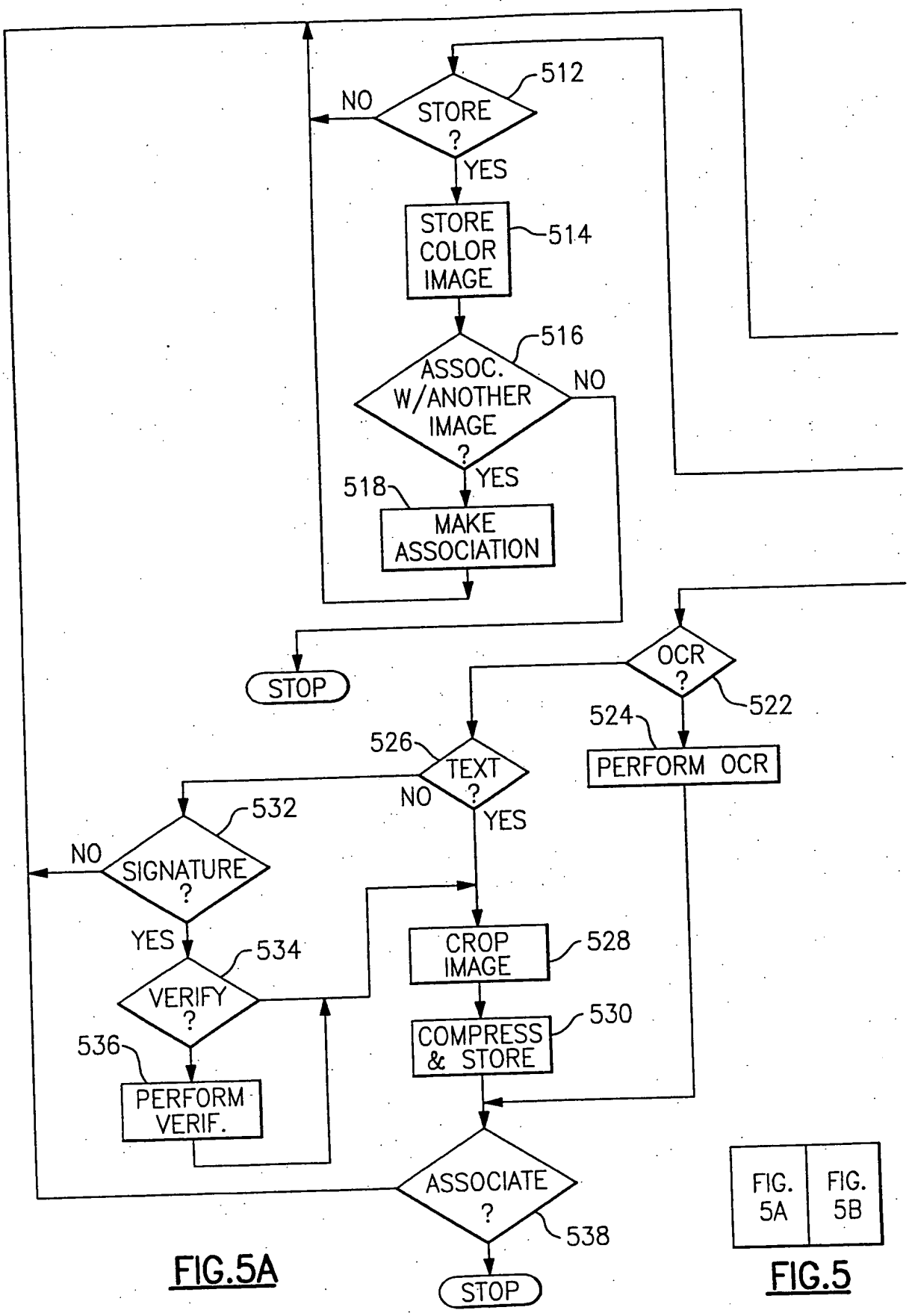

FIG.5A

FIG. 5A	FIG. 5B

FIG.5

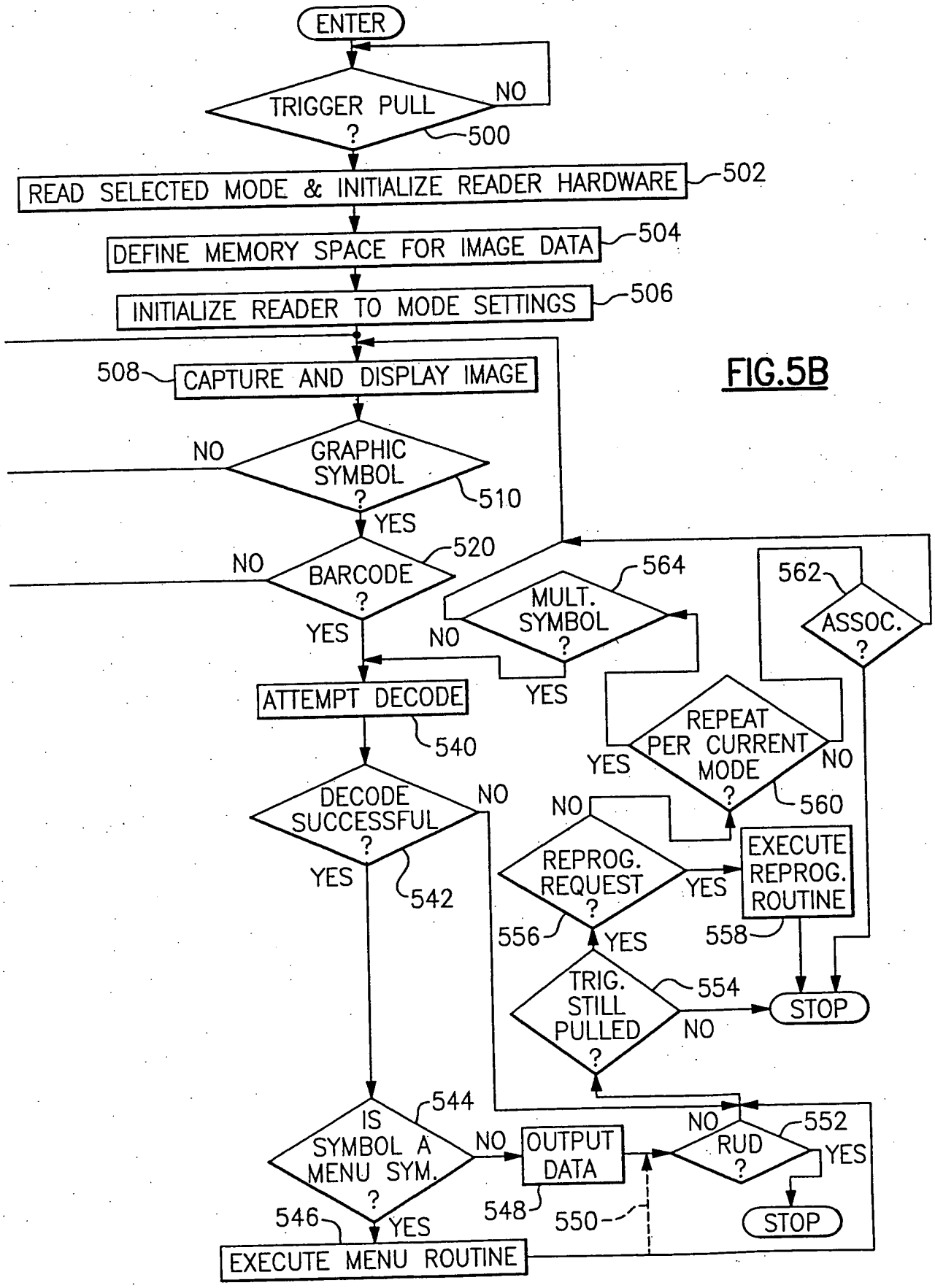
ENTER
TRIGGER PULL ?
NO
500
READ SELECTED MODE & INITIALIZE READER HARDWARE
502
DEFINE MEMORY SPACE FOR IMAGE DATA
504
INITIALIZE READER TO MODE SETTINGS
506
508
CAPTURE AND DISPLAY IMAGE
NO
GRAPHIC SYMBOL ?
510
YES
NO
BARCODE ?
520
YES
MULT. SYMBOL ?
564
NO
YES
562
ASSOC. ?
ATTEMPT DECODE
540
REPEAT PER CURRENT MODE ?
YES
NO
560
DECODE SUCCESSFUL ?
NO
YES
542
NO
REPROG. REQUEST ?
YES
EXECUTE REPROG. ROUTINE
556
YES
558
TRIG. STILL PULLED ?
554
STOP
NO
544
IS SYMBOL A MENU SYM. ?
NO
OUTPUT DATA
548
NO
RUD ?
552
YES
546
YES
550
STOP
EXECUTE MENU ROUTINE

FIG.5B

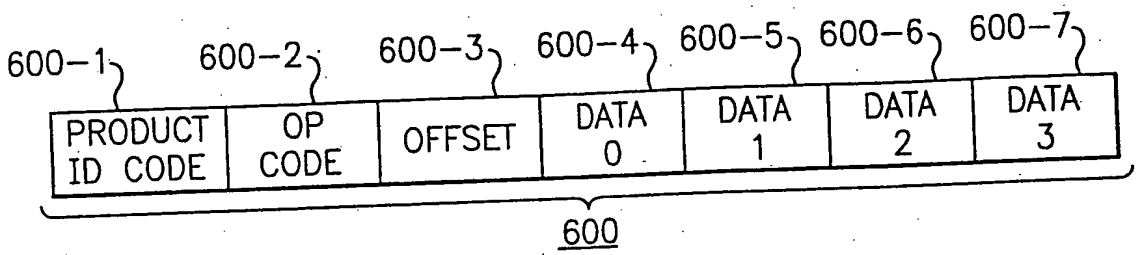

FIG.6A

OPTIONS (OFFSET) TABLE

A. COMMUNICATIONS OPTIONS
   1. RS-232
   2. BAUD RATE
   3. RF LINK
   4. ETHERNET

B. CODE OPTIONS
   1. DISABLE 1D
   2. DISABLE 2D
   3. DISABLE INDIV.
   4. MIN-MAX LENGTH
   5. MULTIPLE SYMBOLS ENABLED

C. SCANNING-DECODING OPTIONS
   1. ONE SHOT
   2. REPEAT UNTIL DONE
   3. REPEAT UNTIL STOPPED
   4. SCAN ON DEMAND
   5. SKIP SCAN
   6. DECODE ON DEMAND

D. OPERATING OPTIONS
   1. BEEPER VOLUME
   2. AIMING LED ON/OFF
   3. AURAL FEEDBACK

E. TRANSMIT OPTIONS
   1. SEND CHECK CHAR'S
   2. SEND CHECKSUM
   3. DATA EDIT OPTIONS

F. READER MODE OPTIONS
   1. AUTOMATIC
   2. SEMI-AUTOMATIC
   3. BAR CODE SCANNING
   4. OCR
   5. SIGNATURE
   6. COLOR IMAGING

FIG.6B

OP CODE TABLE

A. OP CODE "0"-VECTOR PROC.
   1. OUTPUT VERSION OF SOFTWARE
   2. OUTPUT CONTENTS OF PARAMETER TABLE
   3. DISPLAY ENABLED CODES
   4. PRINT PARAMETER TABLE AS BAR CODE SYMBOL

B. OP CODE "1" - CLEAR
C. OP CODE "2" - SET
D. OP CODE "3" - TOGGLE
E. OP CODE "4" - ADD
F. OP CODE "5" - DEFAULT
G. OP CODE "6" - LOAD
H. OP CODE "7" - RESERVED

FIG.6C

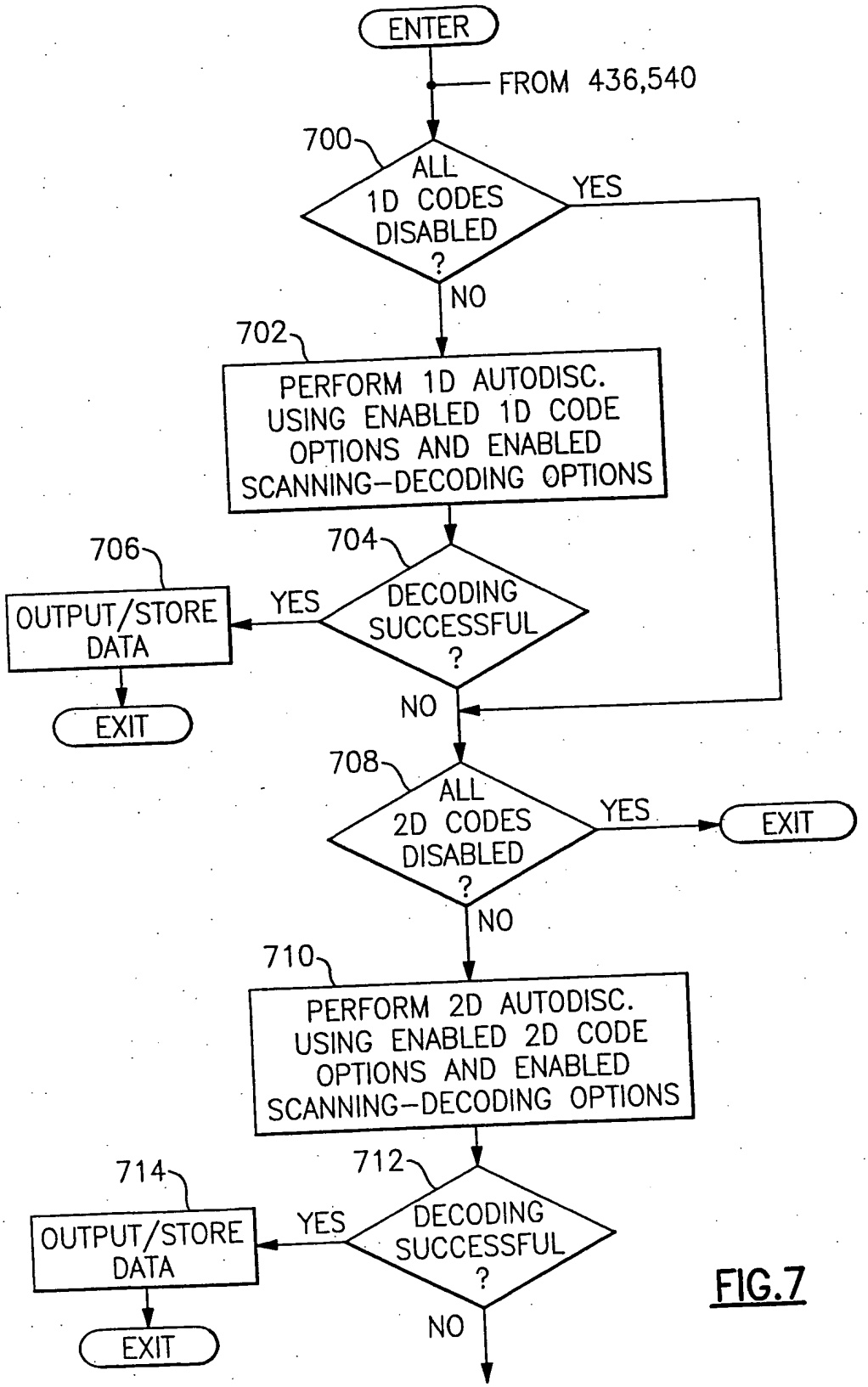
ENTER
FROM 436,540
700
ALL 1D CODES DISABLED ?
YES
NO
702
PERFORM 1D AUTODISC. USING ENABLED 1D CODE OPTIONS AND ENABLED SCANNING–DECODING OPTIONS
704
DECODING SUCCESSFUL ?
706
YES
OUTPUT/STORE DATA
EXIT
NO
708
ALL 2D CODES DISABLED ?
YES
EXIT
NO
710
PERFORM 2D AUTODISC. USING ENABLED 2D CODE OPTIONS AND ENABLED SCANNING–DECODING OPTIONS
712
DECODING SUCCESSFUL ?
714
YES
OUTPUT/STORE DATA
EXIT
NO

FIG.7

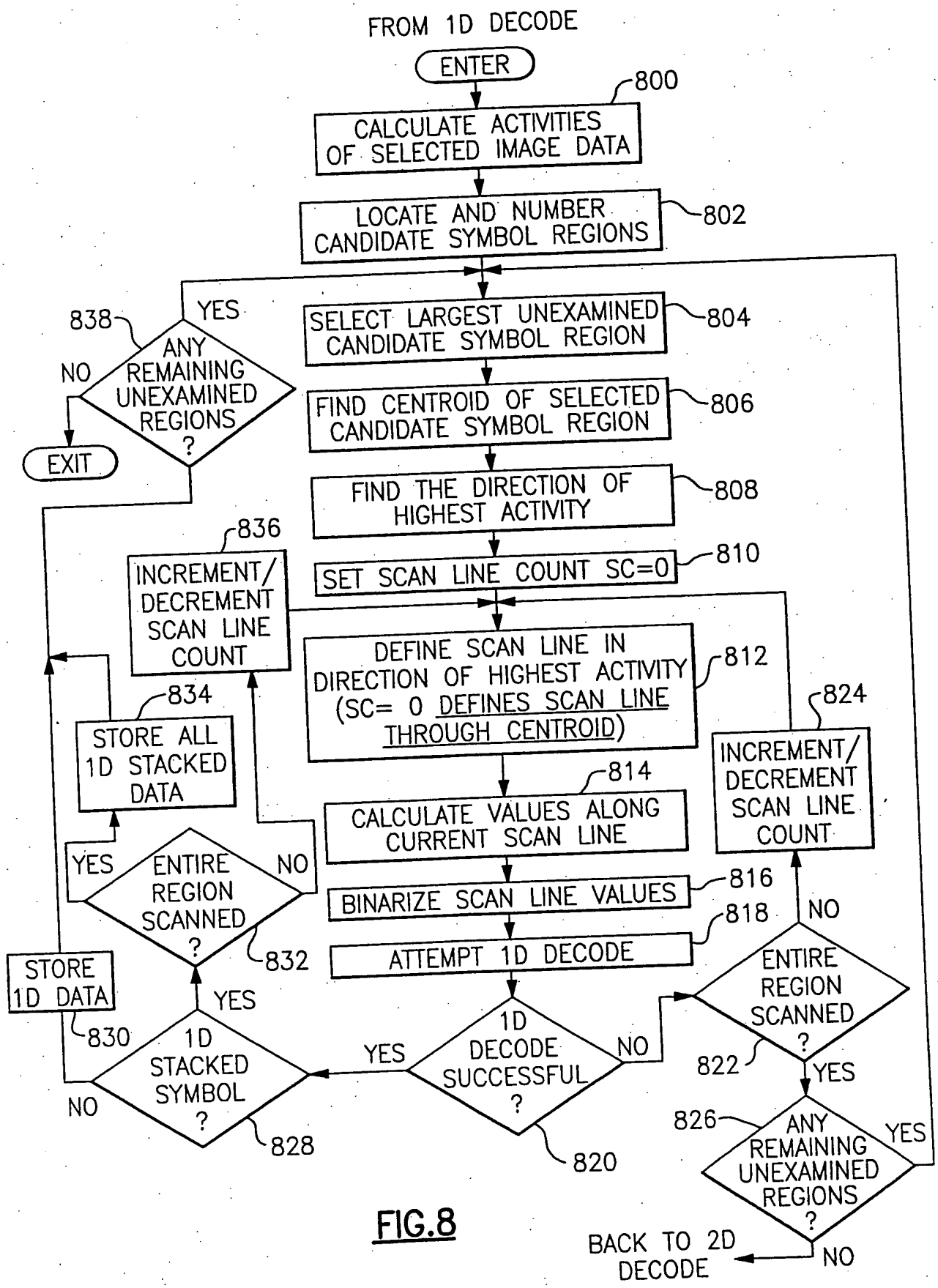
FROM 1D DECODE
ENTER
800
CALCULATE ACTIVITIES OF SELECTED IMAGE DATA
LOCATE AND NUMBER CANDIDATE SYMBOL REGIONS
802
SELECT LARGEST UNEXAMINED CANDIDATE SYMBOL REGION
804
FIND CENTROID OF SELECTED CANDIDATE SYMBOL REGION
806
FIND THE DIRECTION OF HIGHEST ACTIVITY
808
SET SCAN LINE COUNT SC=0
810
DEFINE SCAN LINE IN DIRECTION OF HIGHEST ACTIVITY (SC= 0 DEFINES SCAN LINE THROUGH CENTROID)
812
CALCULATE VALUES ALONG CURRENT SCAN LINE
814
BINARIZE SCAN LINE VALUES
816
ATTEMPT 1D DECODE
818
1D DECODE SUCCESSFUL ?
820
YES
NO
1D STACKED SYMBOL ?
828
YES
NO
STORE 1D DATA
830
ENTIRE REGION SCANNED ?
832
YES
NO
STORE ALL 1D STACKED DATA
834
INCREMENT/ DECREMENT SCAN LINE COUNT
836
ANY REMAINING UNEXAMINED REGIONS ?
838
YES
NO
EXIT
ENTIRE REGION SCANNED ?
822
NO
YES
INCREMENT/ DECREMENT SCAN LINE COUNT
824
ANY REMAINING UNEXAMINED REGIONS ?
826
YES
NO
BACK TO 2D DECODE

FIG.8

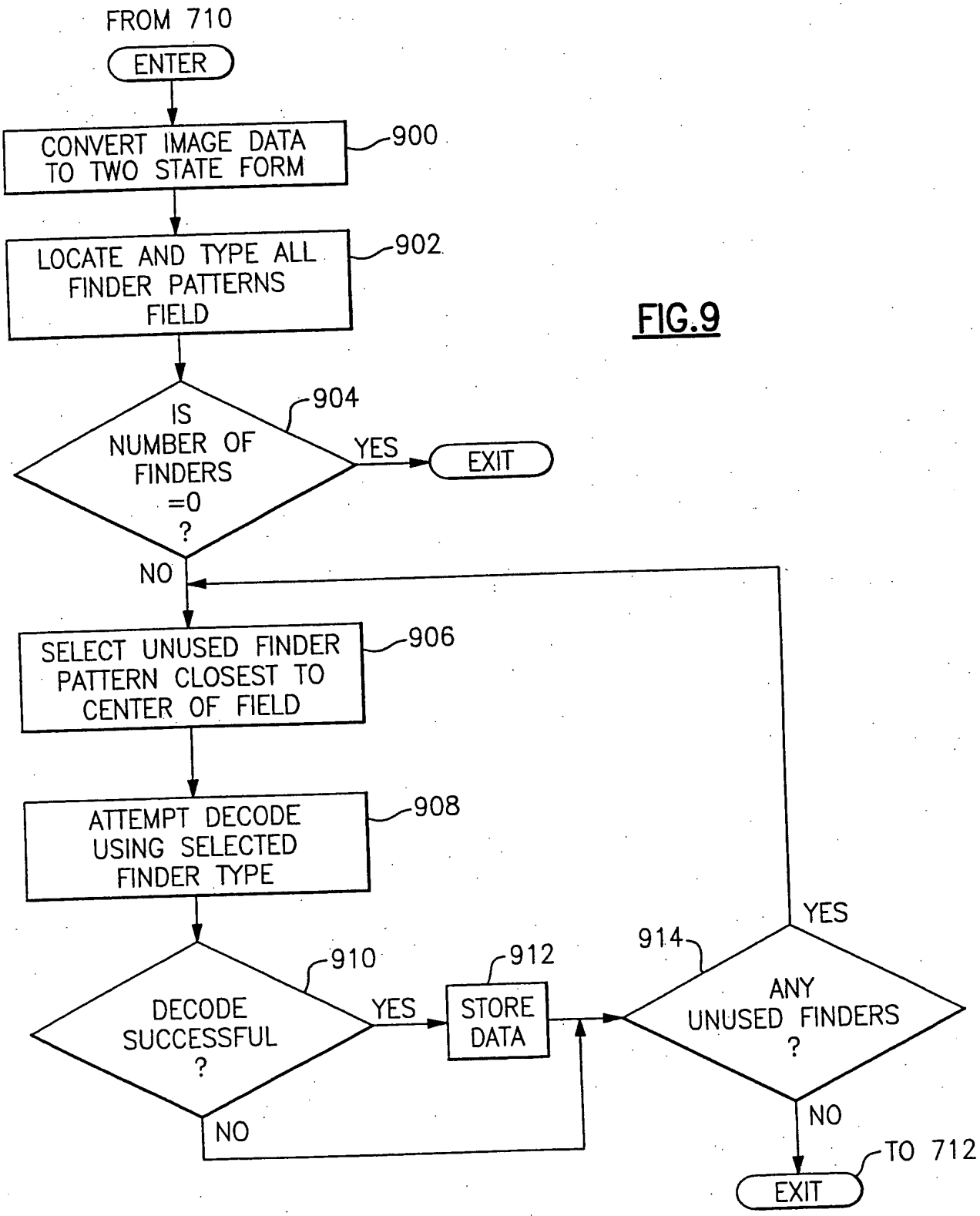
FROM 710
ENTER
CONVERT IMAGE DATA TO TWO STATE FORM
900
LOCATE AND TYPE ALL FINDER PATTERNS FIELD
902
IS NUMBER OF FINDERS =0 ?
904
YES
EXIT
NO
SELECT UNUSED FINDER PATTERN CLOSEST TO CENTER OF FIELD
906
ATTEMPT DECODE USING SELECTED FINDER TYPE
908
DECODE SUCCESSFUL ?
910
YES
STORE DATA
912
NO
ANY UNUSED FINDERS ?
914
YES
NO
TO 712
EXIT

FIG.9

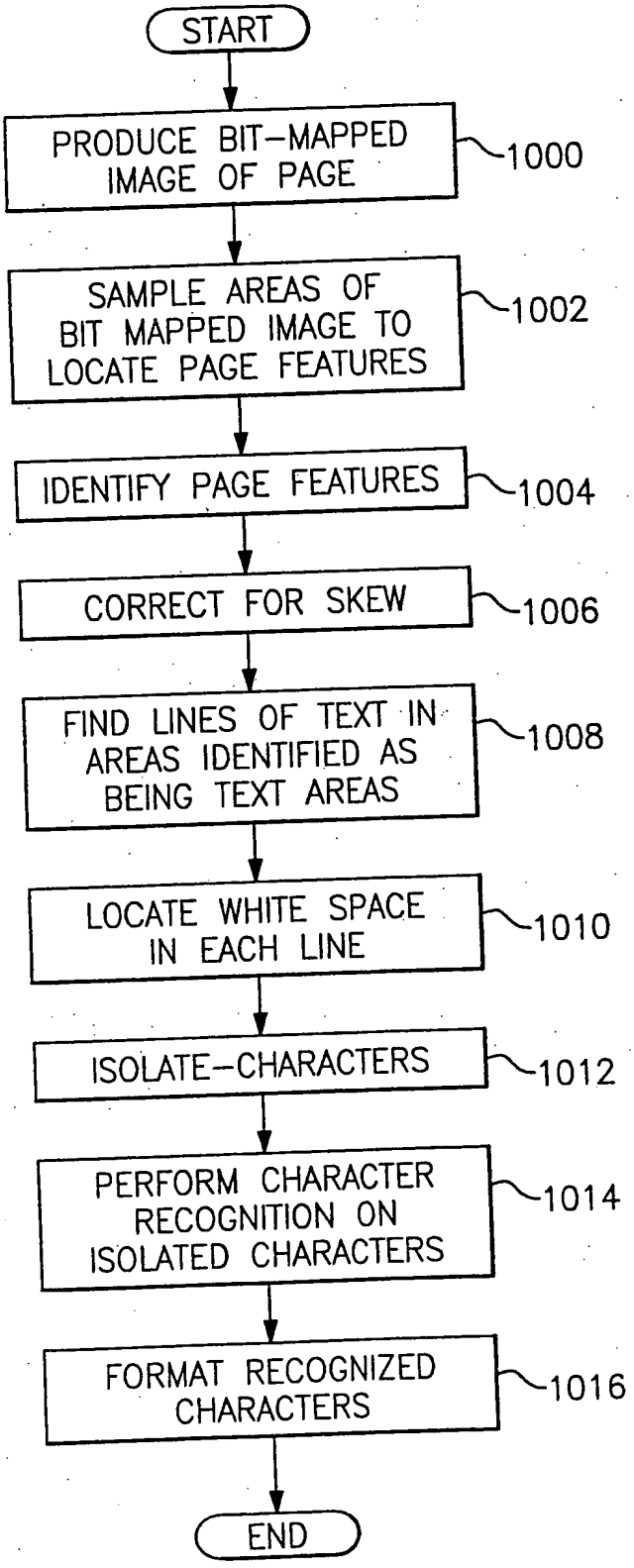
START
PRODUCE BIT-MAPPED IMAGE OF PAGE
1000
SAMPLE AREAS OF BIT MAPPED IMAGE TO LOCATE PAGE FEATURES
1002
IDENTIFY PAGE FEATURES
1004
CORRECT FOR SKEW
1006
FIND LINES OF TEXT IN AREAS IDENTIFIED AS BEING TEXT AREAS
1008
LOCATE WHITE SPACE IN EACH LINE
1010
ISOLATE-CHARACTERS
1012
PERFORM CHARACTER RECOGNITION ON ISOLATED CHARACTERS
1014
FORMAT RECOGNIZED CHARACTERS
1016
END

FIG.10

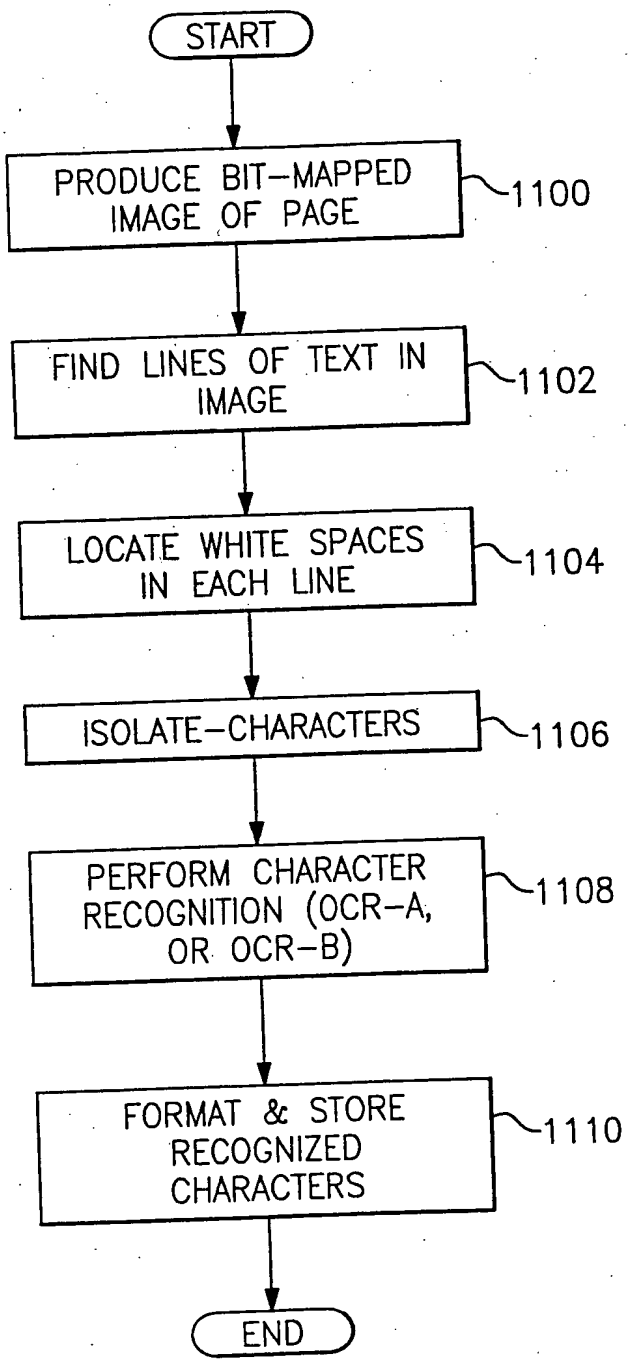
START
PRODUCE BIT-MAPPED IMAGE OF PAGE
1100
FIND LINES OF TEXT IN IMAGE
1102
LOCATE WHITE SPACES IN EACH LINE
1104
ISOLATE-CHARACTERS
1106
PERFORM CHARACTER RECOGNITION (OCR-A, OR OCR-B)
1108
FORMAT & STORE RECOGNIZED CHARACTERS
1110
END

FIG.11

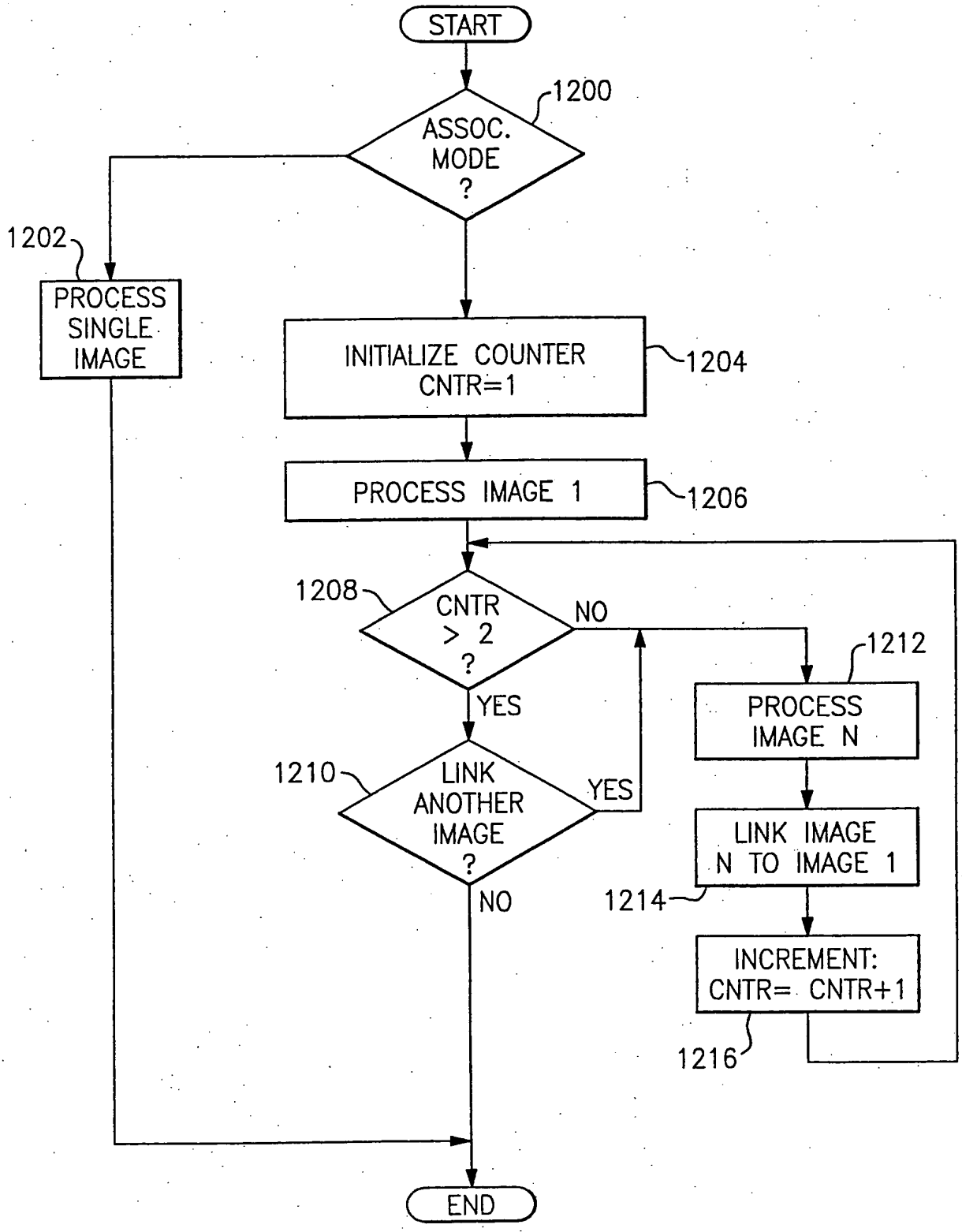
START
1200
ASSOC. MODE ?
1202
PROCESS SINGLE IMAGE
INITIALIZE COUNTER CNTR=1
1204
PROCESS IMAGE 1
1206
1208
CNTR > 2 ?
NO
YES
1212
PROCESS IMAGE N
1210
LINK ANOTHER IMAGE ?
YES
NO
LINK IMAGE N TO IMAGE 1
1214
INCREMENT: CNTR= CNTR+1
1216
END

FIG.12

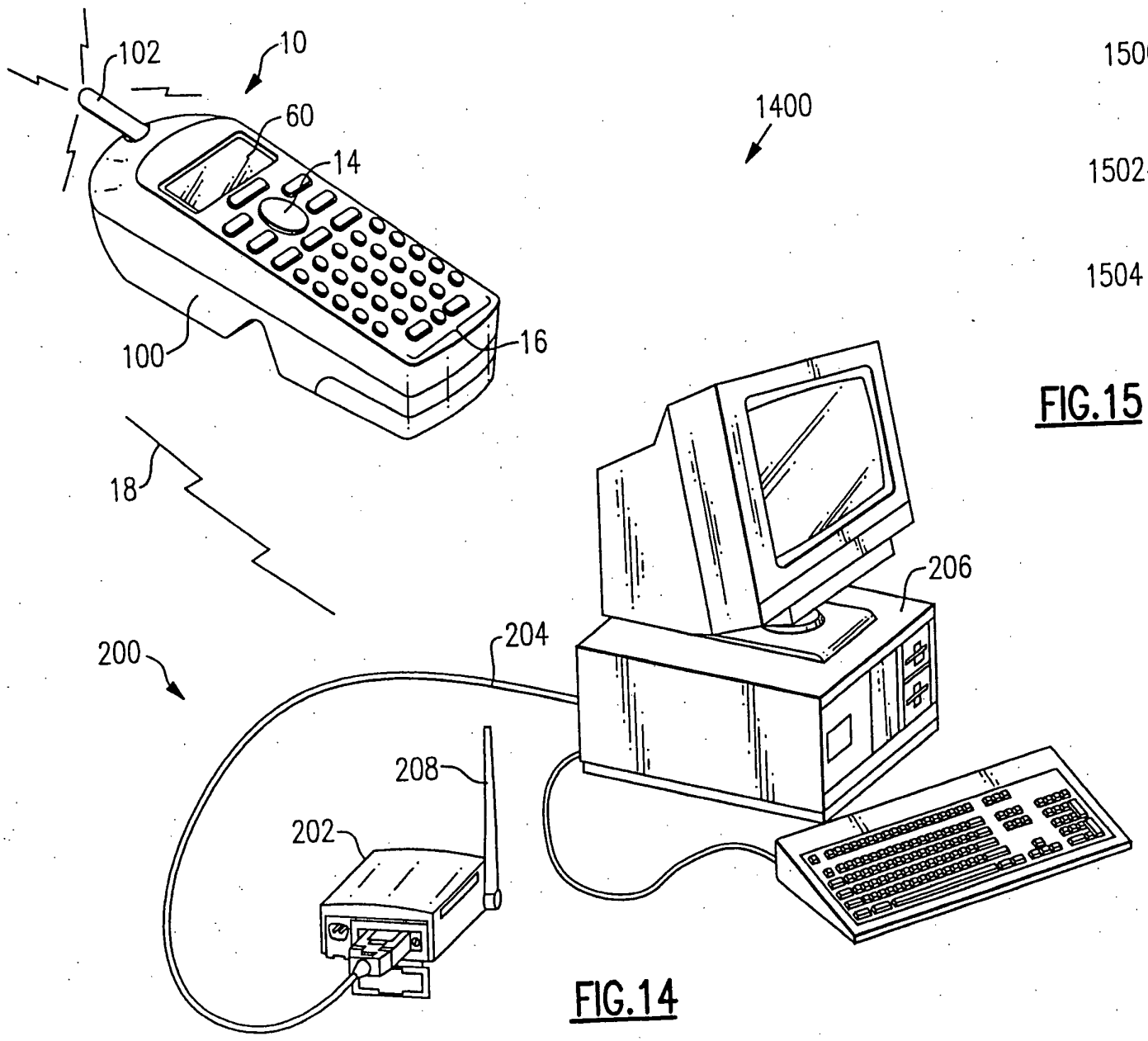
102
10
60
14
1400
100
16
18
206
204
200
208
202

FIG.14

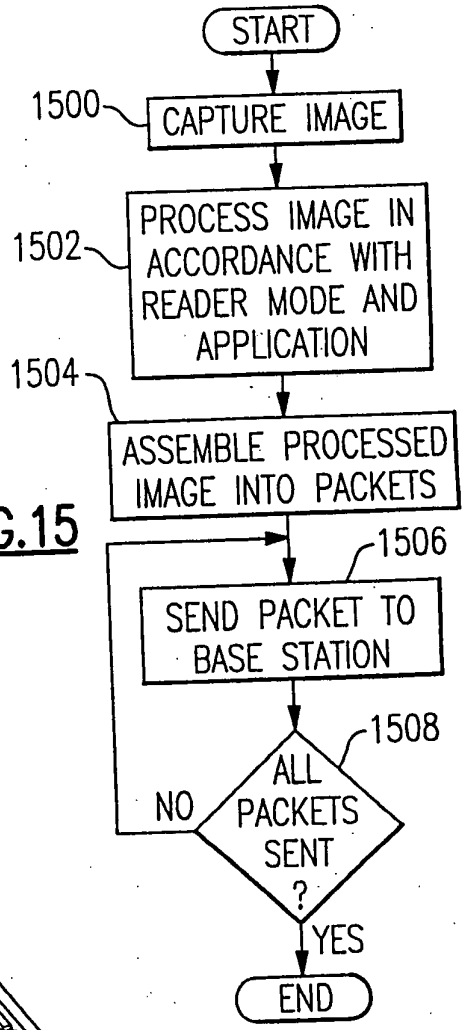
START
1500
CAPTURE IMAGE
1502
PROCESS IMAGE IN ACCORDANCE WITH READER MODE AND APPLICATION
1504
ASSEMBLE PROCESSED IMAGE INTO PACKETS
1506
SEND PACKET TO BASE STATION
1508
ALL PACKETS SENT ?
NO
YES
END

FIG.15

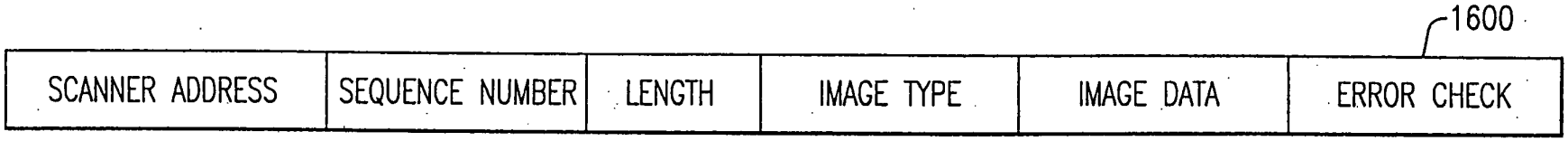

FIG.16A

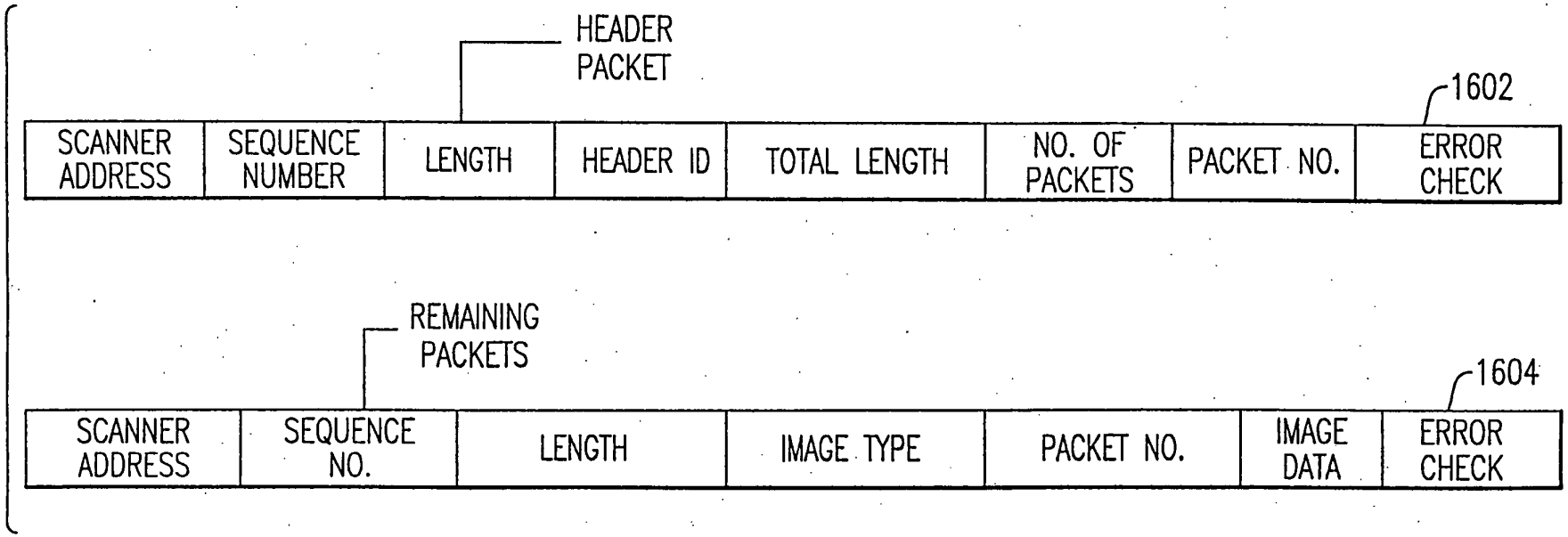

FIG.16B

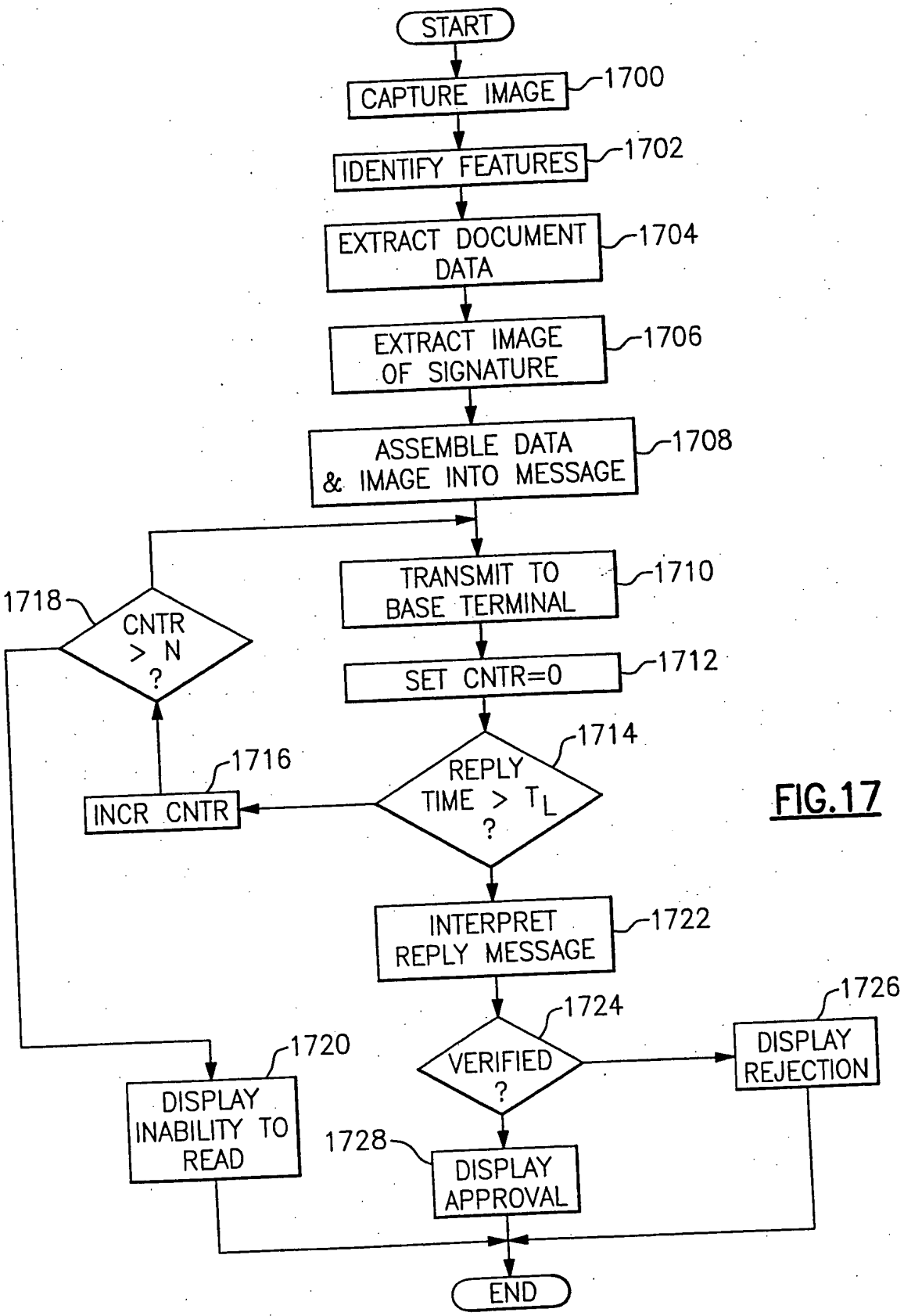
START
CAPTURE IMAGE
1700
IDENTIFY FEATURES
1702
EXTRACT DOCUMENT DATA
1704
EXTRACT IMAGE OF SIGNATURE
1706
ASSEMBLE DATA & IMAGE INTO MESSAGE
1708
TRANSMIT TO BASE TERMINAL
1710
SET CNTR=0
1712
REPLY TIME > T_L ?
1714
INCR CNTR
1716
CNTR > N ?
1718
INTERPRET REPLY MESSAGE
1722
VERIFIED ?
1724
DISPLAY REJECTION
1726
DISPLAY INABILITY TO READ
1720
DISPLAY APPROVAL
1728
END

FIG.17

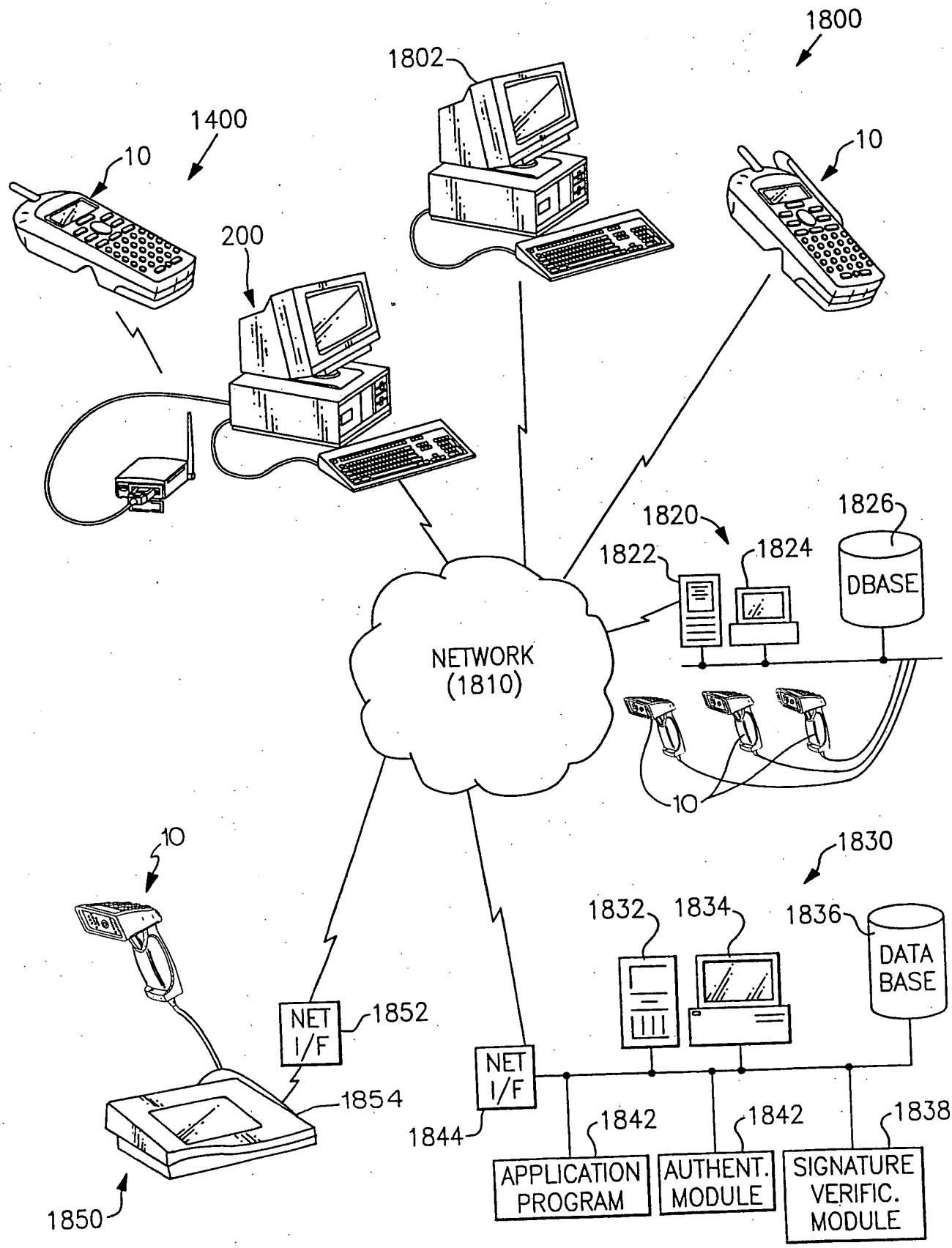
1800
1802
1400
10
200
10
1820
1826
1822
1824
DBASE
NETWORK
(1810)
10
10
1830
1832
1834
1836
DATA
BASE
NET
I/F
1852
NET
I/F
1854
1844
1842
1842
1838
APPLICATION
PROGRAM
AUTHENT.
MODULE
SIGNATURE
VERIFIC.
MODULE
1850

FIG.18